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10/521,886	07/05/2005	Robert Kopesky	60282-USA	8844
Paul A Fair FMC Corporation Patent Administrator 1735 Market Street Philadelphia, PA 19103				
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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/521,886  
Filing Date: July 05, 2005  
Appellant(s): KOPESKY ET AL.

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Kevin J. Dunleavy  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed May 30, 2008 appealing from the Office action mailed October 30, 2007.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

No amendment after final has been filed.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

6,228,213	HANNA	05-2001
WO 01/02441	SCHAIBLE	01-2001
6,392,034	TRUSOVS	05-2002
5,192,569	MCGINLEY	03-1993

### **(9) Grounds of Rejection**

In view of Appellant's arguments submitted May 30, 2008, the rejection of claims 4-7 under 35 USC 112, second paragraph, for being indefinite with regard to "at least about," is withdrawn. Appellant's arguments are persuasive.

The following ground of rejection is applicable to the appealed claims:

#### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-17, 20, 22-24, 26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanna et al. (U.S. 6,228,213 B1, May 8, 2001) in view of Schaible et al. (WO 01/05441 A1, January 11, 2001) and Trusovs et al. (U.S. 6,392,034 B1, May 21, 2002). This rejection is set forth in the prior Office Action mailed October 30, 2007, and reiterated in full below.

Hanna et al. teach a process for the production of microcrystalline cellulose by reactive extrusion. The process involves feeding cellulose into an extruder with a barrel. Acid and cellulose-containing material (pure cellulose can be used) are premixed and fed through the extruder or simultaneously fed into the extruder [column

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3, lines 34-39]. Preferably, the temperature of the extruder barrel is about 80°C to 200°C, and most preferably 140°C [column 3, lines 60-65]. Different heating regimes affect the resulting particle size of the product and particles smaller than 200 microns can be created [column 5, lines 57-58]. The measured level-off degree of polymerization varies with the starting material and is 220 for wood-cellulose microcrystals [column 5, lines 66 and 67 and column 6, lines 1-3]. The cellulose is pressurized by the screw of the extruder and is hydrolyzed by acid. The ratio of acid solution to cellulose is approximately 1:1 [column 4, lines 19-22]. The extrusion is preferably a continuous process [column 4, lines 8-9] and results in reaction times which are shorter than conventional methods [column 4, lines 22-25]. After extrusion, the cellulose product is washed, bleached, and dried [column 2, lines 56-64]. The product can be bleached with hydrogen peroxide [column 4, lines 44-46]. After being bleached, the product is dried by spray drying [column 4, lines 55-60]. The microcrystalline cellulose can also be manufactured using a twin screw extruder [column 5, lines 32-33].

Hanna et al. do not teach a process for producing microcrystalline cellulose using an active oxygen compound. Hanna et al. are silent on the exact pressure used in the method, the pH of the reaction mixture and the residence time of the extrusion.

Schaible et al. teach a process for the production of microcrystalline cellulose comprising hydrolyzing pulp with active oxygen [see abstract]. Specific examples of active oxygen compounds include hydrogen peroxide [page 6, line 15]. The method simultaneously hydrolyzes and bleaches the starting material to obtain a high grade microcrystalline cellulose product [page 2, lines 20-24]. The reaction can be performed

under increased temperature and pressure, the optimization of which can be ascertained by one skilled in the art [page 7, fourth paragraph]. The method of Schaible, et al. results in microcrystalline cellulose having a degree of polymerization as low as 208 [Example 17].

Trusovs et al. teach a method of producing microcrystalline cellulose comprising the addition of hydrogen peroxide. Hydrogen peroxide depolymerizes the substrate and reduces viscosity [column 2, lines 49-54].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use reactive extrusion with hydrogen peroxide to produce microcrystalline cellulose. The skilled artisan would have been motivated to do so with an expectation of success because the extruder method has a shorter reaction time than conventional methods and the use of hydrogen peroxide for hydrolysis also bleaches the material at the same time, so there is no need for a separate bleaching step. It is considered within the skill of one of ordinary skill in the art to optimize parameters such as pressure, time, concentration, and order of addition of reagents. The pH of the reaction mixture during extrusion is an intrinsic feature of the solvents and reagents used in the reaction. Because hydrogen peroxide is known to depolymerize cellulose under standard reaction conditions (Trusovs et al.), it is considered obvious to hold the reaction mixture after shearing to further depolymerize the material.

Claims 18-21, 25-27 and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanna et al. (U.S. 6,228,213 B1, May 8, 2001) in view of Schaible et

al. (WO 01/05441 A1, January 11, 2001) and Trusovs et al. (U.S. 6,392,034 B1, May 21, 2002) as applied to claims 1-17, 22-24 and 28 above, and further in view of McGinley et al. (U.S. 5,192,569, March 9, 1993). This rejection is set forth in the prior Office Action mailed October 30, 2007, and reiterated in full below.

Hanna et al., Schaible et al., and Trusovs et al. teach as set forth above.

Hanna et al. Schaible et al., and Trusovs et al. do not teach attriting the microcrystalline cellulose product or the addition of an additive.

McGinley et al. teach the production of colloidal grades of microcrystalline cellulose by attriting the wetcake after filtration and washing steps, at which time additives such as sodium carboxymethylcellulose (a barrier dispersant) can be added [column 4, lines 63-69]. The attrited, colloidal microcrystalline cellulose may then be dried [column 5, lines 1-3]. Microcrystalline cellulose can be used with other cellulosic materials such as carboxymethylcellulose to form a water-dispersible colloid for use as a stabilizing agent and to enhance the texture of foods [column 1, lines 48-54].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to produce attrited, dried microcrystalline cellulose and to add an additive to the product. The skilled artisan would have been motivated to do so with an expectation of success in order to create a colloidal product which can be used as a food additive, as taught by McGinley et al.

#### **(10) Response to Argument**

Appellant argues that the skilled person would not have a reasonable basis to combine Hanna, Schaible, and Trusovs.

Contrary to Appellant's assertion, each of Hanna, Schaible, and Trusovs are drawn to the production of microcrystalline cellulose as summarized herein:

- Hanna uses acidic conditions and extrusion to depolymerize (or hydrolyze) cellulose, and states that the temperature and pressure in the extruder environment allows more intimate contact between the cellulose and acid, resulting in less acid required and shorter reaction times compared to conventional technology [column 4, lines 10-25].
- Schaible uses active oxygen in an acidic environment to depolymerize (or hydrolyze) cellulose [see abstract]. One advantage of using active oxygen is that it eliminates the need to perform multiple hydrolysis and bleaching steps to provide a high grade microcrystalline cellulose product regardless of starting material [page 2, fourth full paragraph]. The reaction can be performed under increased temperature and pressure, which can be optimized by one skilled in the art [page 7, third full paragraph].
- Trusovs uses alkaline conditions along with hydrogen peroxide to depolymerize (or hydrolyze) and reduce the viscosity of the cellulose suspension [column 2, lines 54-64].

Therefore, because each of the above mentioned references is drawn to production of microcrystalline cellulose, using acidic conditions or alkaline conditions, active oxygen, or combinations of the same, they are all related to the same specific field



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as claimed subject matter. The skilled person would indeed have a reasonable basis to combine the references.

Appellant argues that obtaining a reduction in reaction time cannot be a motivation for the skilled person to modify Schaible, and that the Examiner's alleged reduction in reaction time is pure speculation. However, Hanna teaches that extrusion conditions allow more intimate contact between cellulose and the depolymerization reagent, resulting in shorter reaction time and less reagent required. The skilled person would expect that regardless of which reagent was used for depolymerization, the "more intimate contact" taught by Hanna's extrusion conditions would exist, and thus the skilled artisan could reasonably expect shorter reaction time.

Appellant argues that conventional acid hydrolysis is not interchangeable with active oxygen. Nevertheless, Hanna teaches a process wherein cellulose is hydrolyzed by acid. Schaible teaches a process wherein cellulose is hydrolyzed by active oxygen. Thus, the skilled artisan would have a reasonable expectation of success in substituting one reagent for the other.

Appellant argues that avoidance of a separate bleaching step is inadequate motivation to combine Hanna, Schaible, and Trusovs, because if the starting cellulose is pure enough, no bleaching would be required anyway. Schaible clearly teaches that use of active oxygen provides a product which is lighter in color [for example, see pages

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14 and 15, Examples 12 and 13]. As discussed above, Schaible also teaches the desirability of a process which produces a high quality product, even from lower quality starting materials. Furthermore, avoidance of a separate bleaching step is but one possible motivation for combining the references. As discussed above, each of the references is drawn to production of microcrystalline cellulose, using acidic conditions or alkaline conditions, active oxygen, or combinations of the same, and combining them is reasonable.

Appellant argues that Trusovs is concerned with avoiding acidic hydrolysis, and thus is not combinable with Hanna and Schaible. Trusovs is cited for the teaching that hydrogen peroxide depolymerizes cellulose and reduces the viscosity, as well as to demonstrate, along with Schaible, that depolymerization of cellulose using active oxygen can be performed under either acidic or basic conditions.

Appellant argues that the instantly claimed process is capable of providing microcrystalline cellulose with a lower degree of polymerization than samples obtained by conventional acid hydrolysis. The instant claims are not drawn to microcrystalline cellulose of a particular degree of polymerization. Furthermore, Hanna teaches that harsh hydrolysis conditions such as higher temperatures and higher acid concentrations, along with the speed of the extruder screw, increase hydrolysis and decrease the resulting particle size of the microcrystalline cellulose [column 5, lines 54-

64]. Thus, the achievement of lower degree of polymerization in products prepared under extrusion conditions compared to conventional processes is not unexpected.

Appellant argues that the Examiner has not shown that the features of claims 9 and 10 are taught or suggested by the prior art. Claims 9 and 10 are drawn to the use of aqueous hydrogen peroxide, added to the cellulose material prior to or after introduction of the material to the extruder. Schaible's process (use of active oxygen for hydrolysis) is conducted in, preferably, an aqueous medium [page 6, second paragraph]. Hanna teaches that, for extrusion, cellulose is mixed with acid prior to being fed through an extruder, or the cellulose and acid can be fed into the extruder separately [column 3, lines 30-40]. Whether the cellulose or the depolymerization reagent is added to the extruder first, or whether they are added at the same time, is not considered to be critical, as long as the cellulose and reagent are subjected to extrusion conditions together.

Appellant argues that the Examiner has not shown that the features of claim 14 are taught or suggested by the prior art. Claim 14 requires that the cellulose material comprises about 30% to about 50% by weight of the reaction mixture, and that hydrogen peroxide comprises about 0.1% to about 10% of the reaction mixture. Example 7, taught by Schaible, includes about 40 g of cellulosic material in about 1 L of solution, which is about 40%, and about 21 ml of 50%  $\text{H}_2\text{O}_2$  in about 1 L of solution, which corresponds to about 10.5-21 g of hydrogen peroxide in about 1 L of solution, or

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about 10%. Hanna teaches that the ratio of acid solution to cellulose under conventional conditions is between 5:1 to 8:1, compared to 1:1 under extrusion conditions. As discussed above, the skilled artisan could reasonably expect to use less depolymerization reagent under extrusion conditions than under conventional conditions, so the skilled artisan could reasonably expect to use 10% or less of hydrogen peroxide using the guidance provided by Schaible and Hanna.

Appellant argues that the Examiner has not shown that the features of claims 16 and 17 are taught or suggested by the prior art. Claims 15 and 16 are drawn to the residence time in the extrusion process. Hanna does not teach the residence time, but does state that reaction times are significantly shorter as compared with conventional technology. Schaible teaches reaction times of about 2 hours in the absence of extrusion conditions, and states that temperature and pressure may be increased and optimized by the skilled artisan. Using the guidance provided by Hanna and Schaible, the skilled artisan could optimize temperature, pressure, and reaction time to obtain the desired product.

**(11) Related Proceeding(s) Appendix**

For the above reasons, it is believed that the rejections should be sustained.

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Respectfully submitted,

/Layla Bland/

Examiner, Art Unit 1623

Conferees:

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